BHARAT HEAVY ELECTRICALS LIMITED
UNIT: JHANSI
(WORK. ENGG. & SERVICES DEPTT.)

EQUIPMENT	:	**CNC AXLE GRINDING MACHINE**
ITEM NO	:	**MT-3/3/1442**
LOCATION	:	**LOCOMOTIVE**
QUANTITY	:	**1 NO.**
SPECIFICATION	:	**6199/Rev-1**

1.PURPOSE OF MACHINE:-

Machine should be able to perform grinding of Railway Axles (having length ranging from 1000 to 3000 mm, Dia ranging from 50 to 300 mm and weight as 1000 Kg.) with required finish as per attached Axle drawing no.-27191102001/Rev01.

2. CONFIGUARTION OF MACHINE:-

Machine is to have rigid structure with optimized construction. Hardened and ground wheel spindle should be mounted on hydrodynamic precision bearings. Machine is to have work head stock as a work driver and tail stock and steady rests, all movable on the machine bed through turcite coated guideways. Spindle drive for wheel head spindle & work head spindle (with programmable speeds) are to be controlled by AC motor through CNC system. Wheel head infeed slide(x- axis) & table traverse(z-axis) are to be controlled with precision ball screws & nut system driven by servo motor through CNC system. Continuous lubrication for guide ways of worktable, infeed slide and ball screws of both axes is to be through a separate lubrication tank with chiller type oil cooling unit. Suitable coolant system with paper band filtration cum magnetic separator is to be provided with machine. Manual portable inching system (or Manual Pulse guide) & suitable steady rests, Hydraulic power pack & motors are to be provided with the machine. Suitable enclosed guarding (top open for loading and unloading by crane) & panel AC for electrical cabinet are to be provided with machine. Machine should be suitable for power supply- 415 volt,50Hz, 3-phase,4-wire AC.

3. TECHNICAL SPECIFICATION :- CNC AXLE GRINDING MACHINE with standard accessories as per following technical specifications is required.

(1) M/c should be suitable for grinding operation for AXLE (workpiece having having length ranging from 1000 to 3000 mm, Dia ranging from 50 to 300 mm and weight as 1000 Kg) with required finish as per enclosed axle drawing No.- 27191102001/Rev01.Machine should be able to meet all accuracies & surface finish as per this drawing.(Making of work piece as per drawing shall be proven during commissioning)

(2) Size of grinding wheel-	750 mm(dia)x100(width)x305 hole (with worn out wheel dia as 550 mm)
(3) Wheel head motor speed range -	750-1000 rpm
(4) Max. wheel peripheral speed(constant)	33 mtr/sec.
(5) Work head speed range-	10-100 rpm
(6) Max. swing over table	550 mm
(7) Table traverse (z- axis)	3100 mm
(8) Table speed	4000 (Max.)/ 60 (Min.) mm / min.

(9) Min. programmable resolution of table 0.001 mm
(10) Traverse of infeed slide (x-axis) 300 mm
(11) Infeed rates 6000 (Max.)/ 0.10 (Min.) mm / min.
(12) Min. programmable resolution of infeed slide 0.001 mm
(13) Tail stock max. Quill movement 55 mm
(14) Centre type for work head and tail stock MT-6
(15) Grinding finish required- 0.4 microns
(16) Taperness of M/c- 0.005 mm in 100 mm length.
(17) Steady rests 02 Nos.
(18) MPG(Manual pulse generator)
(19) Coolant system with paper band cum magnetic separator.
(20) CNC system:-

Microprocessor based CNC system with integrated operator panel and CRT is to be provided with the machine for control of following paths –

(i) Two linear axes (x and z axes)control
(ii) Simultaneous positioning of both axes.
(iii) Linear and circulation interpolation.
(iv) Input/ output resolution.
(v) Inch/ metric input system.
(vi) Program input /output during program execution
(vii) Manual data input via keyboard.
(viii) Incremental measuring system
(ix) Software limits for each axis.
(x) Minimum wheel diameter monitoring
(xi) Integrated gauging control.
(xii) Multifunction key board
(xiii) Program access through external signals
(xiv) Block interrupts and advance through external signals grinding.
(xv) Preparatory function keys.
(xvi) Diameter programming.
(xvii) Parameter computation and comparison.
(xviii) Pitch error compensation
(xix) Wheel diameter compensation
(xx) Backlash compensation
(xxi) Automatic wheel dressing compensation
(xxii) Easy pick up dressing position.
(xxiii) Interfacing of AUTOCAD drawing/PC programs with machine software.

(21) Standard accessories:-

(i) Suitable CNC system (with interfacing of AUTOCAD drawings / PC programs with machine software).
(ii) Electrical equipment.
(iii) One grinding wheel dresser mounted on tail stock.
(iv) One set of belts for work head and wheel head drives (mounted on machine).
(v) One set of service tools (tool kit).
(vi) Colour of machine as per BHEL requirement (Verdigris green to IS 5/1961)
(vii) 3 set of O & M manuals
(viii) Panel AC for electrical/ CNC cabinet.
(ix) Steady rests (2 nos).
(x) Coolant system with paper band cum magnetic separator.
(xi) MPG (Manual pulse generator)
(xii) Machine lamp.
(xiii) Lubrication tank with chiller type oil cooling unit.

(xiv) Foundation bolts & leveling wedges for foundation.

Note:-1. All standard accessories shall be supplied with the machine as a part of machine without extra cost

2. Making of job as per drawing shall be proven during commissioning.

3. Geometrical accuracy tests as per IS -2368(part-I)/ 1979 shall be proven during commissioning

4. Training to BHEL personnel at BHEL works for the interfacing of AUTOCAD drawings / PC programs with machine software shall be given by suppliers

4. MANDATORY DOCUMENTS REQUIRED TO BE SUBMITTED WITH THE OFFER-

1. Dimensioned outline general arrangement drawing
2. Details of safety devices / guards provided.
3. Electrical schematic diagram.
4. Total electrical load.
5. Quotation with item wise prices of spares for 2 years normal working.
6. Details of standard & optional accessories offered.
7. Catalogues / leaflets of machine offered .Operation & maintenance manual (3sets)& tool kit to be provided with machine.
8. Make & details (rating) of the control panels & other items like motors, gears, pumps, hydraulic systems etc.
9. Charges for the Erection & commissioning of the machine at BHEL Jhansi should be quoted in offer separately.
10. Make of bought out items- Bought out items of following make are to be provided & mentioned in offer..

(a) CNC system-	**Preferably Siemens make**
(b) Motor-	**Siemens/ Alstom / GEC/ABB/Crompton make**
(c) Gear box-	**Greaves / Relicon / Shanti make**
(d) Hydraulic system-	**Rexroth / L& T make/vickers**
(e) Bearings-	**NBC/ SKF/FAG make**

5. GENERAL CONDITIONS-

1. The above machine should be most updated in design incorporating the features.
2. The machine should be painted with one coat of red oxide primer & two coats of finishing paint before dispatch. Colour of the finishing paint should be **verdigris Green to IS 5/1961.**
3. Machine will be inspected & tried by our engineer prior to dispatch. Provision is to be made for deputation of commissioning engineer for erection & commissioning of the machine at BHEL ,Jhansi. All tools tackles & manpower shall be in suppliers scope. All civil work shall be done by BHEL based on foundation drawing to be submitted by supplier.
4. The performance of the machine should be demonstrated by the supplier after its successful commissioning at our works. Training at BHEL works to our operators should be given by supplier's representative.

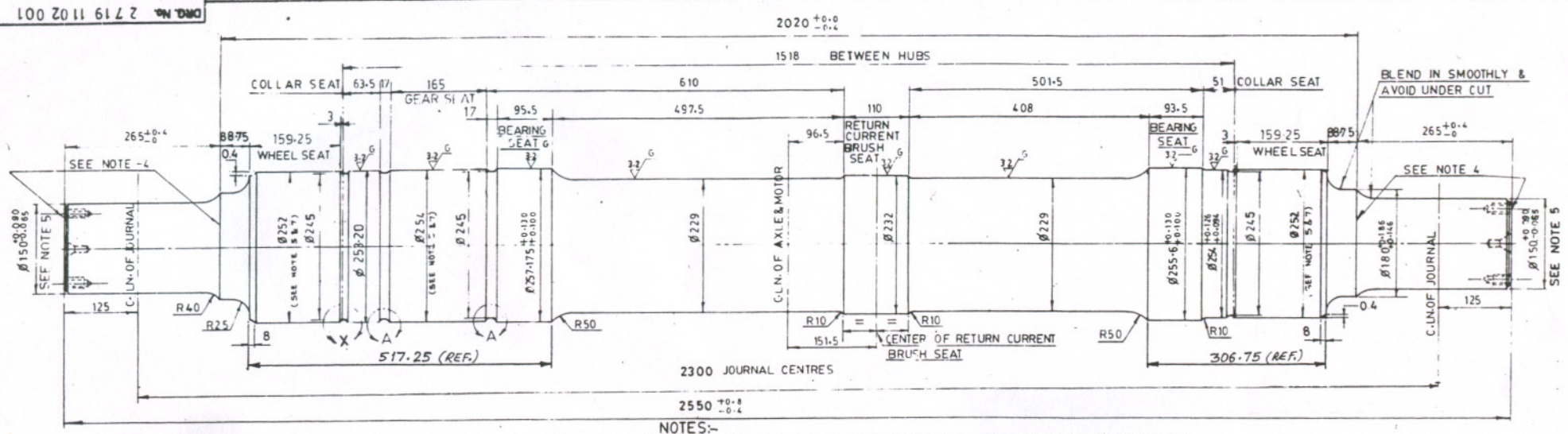
6. QUALIFYING CONDITIONS

The subject machine will mainly be used for machining of locomotive's axle as per attached drawing .Only those vender, who have supplied and commissioned **2 Nos**. such machines in the past ten years for similar application and have documentary proof to support that the machines are presently working satisfactorily for more than one year (more than six month if supplied to BHEL) after commissioning shall quote. The following information is to be submitted by the vender about the companies where similar machines have been supplied. This is required from all venders for qualifications of their offers.

1. Name of the customer/ company where similar machine/ crane is installed
2. Complete postal address of the customer
3. Year of commissioning
4. Name and designation of the contact person of the customer
5. Phone , Fax No. and e-mail address of the contact person of the customer
6. Performance certificate from the customer regarding satisfactory performance of the machine/ crane supplied to them

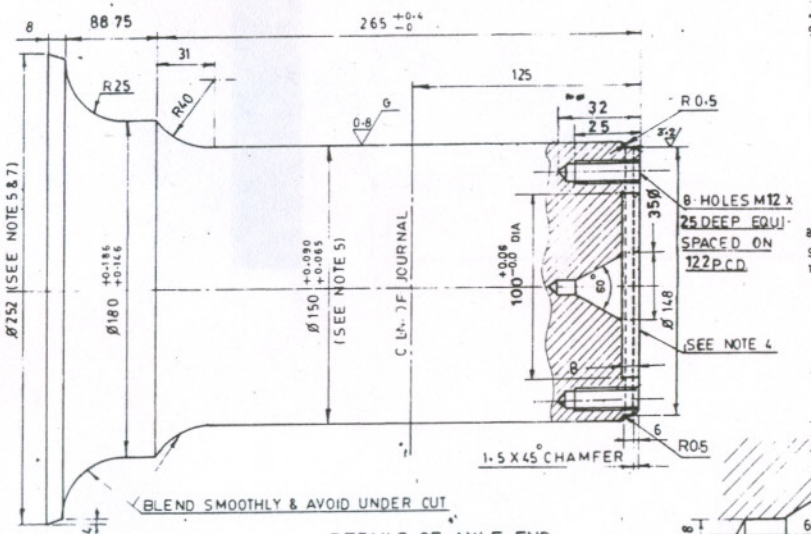
Date	Prepared By	Checked By	Approved By	
14/3/08	Dy. Mgr (WEX)	Mgr.(WEX)	DGM.(WEX)	Sr. Mgr (LMM)

DRG. No. 2 719 11 02 001

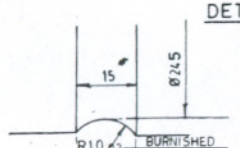


NOTES:-

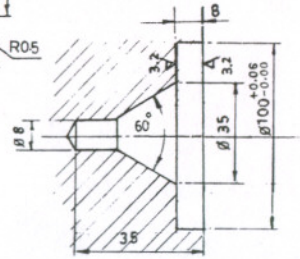
1. SURFACE FINISH & FORMS ARE IMPORTANT AND MUST BE ENSURED AS SPECIFIED [100% INSPECTION].
2. GRIND ALL OVER UNLESS OTHERWISE SHOWN TO OBTAIN A SURFACE FINISH VALUE 0·4 TO 1·6 µm (Ra VALUE). RADII TO BE POLISHED UNTIL FREE FROM TOOL MARKS & SCRATCHES.
3. REMOVE ALL SHARP CORNERS.
4. PERMISSIBLE DEVIATION FROM VERTICAL PLANE WHEN SUPPORTED IN LATHER CENTRES ≤ 0·04 mm.
5. PERMISSIBLE LIMITS FOR AXLE JOURNALS GEAR SEATS, COLLAR SEATS, WHEEL SEATS & BEARING SEAT.
   a) OVALITY:- 0·0125mm MAX.
   b) TAPER:- 0·00015 mm MAX. PER mm LENGTH.
6. ALL TESTS AS SPECIFIED IN IRS R 43 SHALL BE CARRIED OUT & TEST CERTIFICATES FOR SAME SUBMITED TO BHEL IN TRIPLICATE. TEST CERTIFICATE FOR AXLES SHALL MENTION THE STAMPING PARTICULARS RELEVANT TO AXLES.
7. THE WHEEL SEAT, GEAR SEAT & COLLAR SEAT SHOULD BE GROUND TO SUCH SIZE WHICH WILL GIVE THE SPECIFIED PRESSING IN FORCE. THE TOLERENCES SPECIFIED FOR THESE DIMENSIONS & INTERFERENCE OBTAINABLE ARE FOR INITIAL GUIDENCE ONLY. WHEEL PRESSING SHOP SHOULD ESTABLISH THEIR OWN PRACTICE TO GRIND THESE SEATS DEPENDING ON SURFACE FINISH, LUBRICANT USED & OTHER ENVIROMENTAL FACTORS SO AS TO GET THE SPECIFIED PRESSING IN FORCE.
8. ALL AXLES SUBJECTED TO ULTRASONIC INSPECTION AND MAGNETIC PARTICLE OR LIQUID PENETRANT TESTS.
9. FOR STAMPING REFER IRS R 43.
10. ALLOWABLE DEVIATIONS FOR DIMENSIONS WITHOUT SPECIFIED TOLERANCES TO BE AS PER CORP. STD. AA0230206 FINE CLASS.



DETAILS OF AXLE END



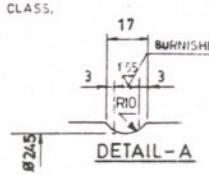
DETAIL X



LATHE CENTRE DETAIL

STYLE LIST			
STYLE NO	IT NO/VAR INCLUDED	DESCRIPTION	VERIFIED SIGN DATE
	001	AXLE FINISHED	

11. FOR ALTERNATE OF AXLE ROUGH TURNED REFER DRG. NO. 2 719 1101 029.



DETAIL – A

VAR OO	REMARKS	VAR No.	ITEM No.	DESCRIPTION	STD.	DRAWING No.	IT No./VAR	MATL CODE	MATL SPECN.	UNIT	UNIT WT(Kg)	QTY	GS	ZONE
001			001	AXLE (ROUGH TURNED		2 719 11 02 000	001 ST				846·80			

CARD TYPE-3 → CARD TYPE-1 → CARD TYPE-2

ADDITIONAL INFORMATION

STATUS OF DRAWING: U

DISTRIBUTION OF PRINTS: LME-1, LMP-2, LMM-3, BAY-1R2-3, BAY3-1

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: 5000 hp. A.C. LOCO./WCAM-3/WCAG-1

BHARAT HEAVY ELECTRICALS LIMITED
JHANSI

	NAME	SIGN	DATE
DRN	N.K.SINGH		25.1.92
CHD			25.1.92
APPD	P.G.K.		25.1.92

REV.	DATE	ALTERED	CHECKED	Appd.
01	1-6-99	NOTE-11 ADDED. REF. TO ASSY. DRG.		

DEPT. LME | CODE 404 | GRADE OF UN. TOL DIM. | SCALE 1:5 | WEIGHT (Kg.)

REF. TO ASSY. DRG. 1 719 11 04 0008-002
1 719 11 02 000
ITEM No. 001

TITLE: AXLE FINISHED (FOR HS 1050 T.R. MOTOR WITH ROLLER BEARING)

CARD CODE

DRAWING No. 2 719 11 02 001 REV. 01

SHEET No. 01 No. OF SHEETS 01

R.D.S.O.SK.DL-4188 | REF. DRG. No. ITEM-2 | SIGN. & DATE | No.